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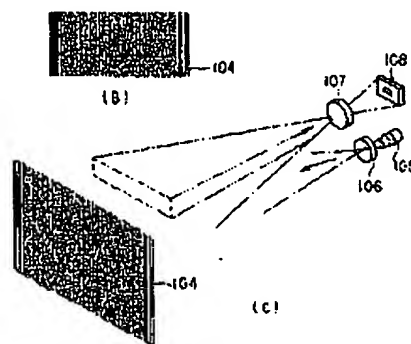
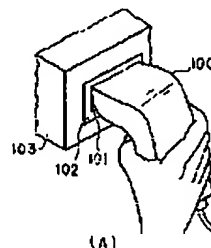
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(54) 【発明の名称】 シンボル情報読取方法及び装置、及び光電変換スキャナ

(57) 【要約】

【目的】 比較的安価なCCD型バーコードスキャナを使用して二次元バーコードシンボルを読み取るための簡単且つ比較的能率の良い手法を提供すること。

【構成】 二次元バーコードシンボル104を含む視野をリニアフォトダイオードアレイ108で光学的に撮像し、該リニアフォトダイオードアレイ108に衝突する光に対応するバイナリデータをメモリに転送する。そして、上記リニアフォトダイオードアレイ108が移動されて、上記シンボル104の別の行を撮像し、上記シンボル104の全ての行が読み取られるまで、上記メモリ転送及び移動プロセスが繰り返される。そして、上記シンボル104中に含まれるバーコード情報を表わすデータ出力が生成される。



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【特許請求の範囲】

【請求項1】 読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったシンボルを含む視野をリニア光ディテクタアレイで光学的に撮像する第1のステップと、
前記リニア光ディテクタアレイに衝突する光に対応するバイナリデータをメモリに転送する第2のステップと、
前記リニア光ディテクタアレイを移動させて、前記シンボルの別の行を撮像する第3のステップと、
前記シンボルの全ての行が読み取られるまで、前記第1乃至第3のステップを繰り返して行う第4のステップと、
前記シンボル中に含まれるバーコード情報を表わすデータ出力を生成する第5のステップと、
を具備することを特徴とするシンボル情報読取方法。

【請求項2】 読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったバーコードシンボルを読み取るシンボル情報読取装置に於いて、

前記シンボルを照明するための光源と、

前記シンボルの一つの行を含む視野を持つ光ディテクタアレイと、

前記光ディテクタアレイに衝突する光に対応するバイナリデータをメモリに転送するための手段と、

前記メモリ中の前記バイナリデータを前記シンボルの一つの行によって表わされるデータにデコードするための手段と、

それぞれの行が読み取られるにつれ、前記シンボルのそれぞれの行によって表わされるデータを累積するためのメモリ手段と、

シンボル全体のそれぞれの行が読み取られたことを決定し、前記シンボル中に含まれるバーコード情報を表わすデータ出力を生成するための手段と、

を具備することを特徴とするシンボル情報読取装置。

【請求項3】 異なる光反射率の部分を持つシンボルを読み取るための光電変換スキャナに於いて、
ハウジングと、

前記ハウジング内に搭載され、光ビームを発生してそれをその出路に沿って配向するための手段と、

前記ハウジング内に搭載され、視野上の前記シンボルで反射された光を検出し、前記シンボルを表わす電気信号を発生するディテクタ手段と、

前記ハウジング内に搭載され、前記外部へ出て行く光ビームをフォーカスするための第1の部分と、前記反射光を受けて前記ディテクタ手段にそれを向けるための第2の部分とを有するウィンドウ手段と、

を具備することを特徴とする光電変換スキャナ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、概して、バーコード等の光反射率の異なる部分を持つシンボルを光電変換して

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読み取るシンボル情報読取方法及び装置及びそれを用いる光電変換スキャナに関し、特に、固体撮像素子技術を用いて、スタックドバーコード即ち二次元バーコードを読み取るものに関する。

【0002】

【従来の技術】 近年、商品等の表面に貼付されたラベル、或いはその商品等の表面に直に形成されたバーコードシンボルを読み取る光学式読取装置や光学式スキャナシステムが種々開発されてきている。バーコードシンボルとは、互いに異なる光反射特性を持つバーとスペースとからなるもので、種々の幅のスペースにより互いに間隔をあけて配置された種々の幅を有する一連のバーによって構成したシンボルのことである。上記読取装置やスキャナシステムは、図形的なシンボルを電気的な信号に光電変換して、当該商品の説明や当該商品の何かの特徴を意味する英数字文字にデコードする。そのような英数字文字は、通常はデジタルデータで表され、データ処理システムへの入力として利用されて、POS（ポイントオブセールス＝販売時点情報管理システム）処理や在庫管理などに応用される。この種の一般的なスキャナシステムは、例えば、米国特許第4,251,798号明細書、米国特許第4,369,361号明細書、米国特許第4,387,297号明細書、米国特許第4,409,470号明細書、米国特許第4,760,248号明細書、米国特許第4,896,026号明細書、等に開示されている。

【0003】 これら米国特許の幾つかに開示されているように、そのようなスキャナシステムの一形態として、手持ち式の携帯型レーザスキャナヘッドがあり、これは、使用者が手で持った時に、読み取るべき目標及びシンボルに、当該ヘッド、特にレーザビームを照準できるような構成としたものである。

【0004】 レーザスキャナバーコード読取装置に於ける光源は、ガスレーザや半導体レーザが用いられるのが一般的ではあるが、特に、スキャナシステムに於ける光源としては、特に、その小型なこと、低価格なこと、及び低い消費電力の点から、半導体デバイスを使用するのが望ましい。レーザビームは、通常はフォーカス用の光学部材によって光学的に変形され、目標距離で所定の大さきのビームスポットを作る。この目標距離でのビームスポットの大きさは、光反射率の異なる領域の間、即ちシンボルのバーとスペースの間の最小幅とはほぼ同じであることが好ましい。

【0005】 バーコードシンボルは、バー、つまり種々の幅を持つことのできる矩形形状の要素から形成される。このような要素の特定の配列がキャラクタを定義するもので、これは、使用されるコード即ち「シンボル体系」により決定されている規則と定義のセットに従って表わされる。バーとスペースの相対的な大きさは、使用されるコードの種類によって決定され、同

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様に、バーとスペースの実際のサイズも、使用されるコードの種類によって決定される。バーコードシンボルによって表わされる1インチ(2.54cm)当たりのキャラクターの数が、シンボルの密度と呼ばれる。望みの一連の文字を符号化するためには、そのメッセージの各文字がそれ自身対応するグループの要素によって表わされる要素の配列を集合が共に結び付けられて、完全なバーコードシンボルを形成する。幾つかのシンボル体系に於いては、そのバーコードの開始位置と終了位置を示す独特な「スタート」及び「ストップ」キャラクターが使用されている。現在、多数の異なるバーコードシンボル体系があり、UPC/EANコード、CODE 39、CODE 128、CODABAR (NW-7)、ITF (Interleaved 2 of 5) コード等が知られている。

【0006】ここで、以下の説明のために、シンボル体系によって認識され且つ定義されるキャラクターを正当キャラクターと、またそのシンボル体系によって認識されず且つ定義されないキャラクターを異常キャラクターと称するものとする。従って、あるシンボル体系によってデコードすることができない要素の配列は、当該シンボル体系のための異常キャラクターに相当する。

【0007】所定の大さきの表面領域上に示される即ち記録されることができる情報量を増大するために、近年、幾つかの新しいバーコードシンボルが開発されてきている。それらの新しいコード標準の一つであるCODE 49は、バーを水平方向に延ばす代わりに、キャラクターの列を垂直方向に積み重ねることによる「二次元」の概念を導いている。即ち、たった一つの行の代わりに、バーとスペースのパターンの幾つかの行がある。このCODE 49の構造は、米国特許第4,794,239号明細書に開示されている。また、「PDF 417」として知られている別の構造は、米国特許出願第461,881号で論じられている。

【0008】当該分野で既知のスキナシステムに於いては、光ビームは、光路上に配置されたレンズもしくは同様の光学素子によって、その表面上にバーコードシンボルを含む目標に対して向けられる。ビーム移動型のスキナは、光ビームの経路中に配置された鏡のような走査素子の動きによって、光ビームがシンボルを横切って一行もしくは一連の複数行を繰り返し走査させることによって動作する。上記走査素子は、シンボルを横切ってビームスポットをスイープし、シンボルを横切る及び通過する走査ラインをトレースするか、或いは、スキナの視野をスイープして走査される。或いは、ビームスポットとスキナの視野を両方スイープさせても良い。

【0009】バーコード読取システムはまた、シンボルから反射された即ち散乱された光を検出するよう機能するセンサ即ちフォトディテクタを含んでいる。フォトディテクタ即ちセンサは、シンボルの全幅よりもわずかに

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広い視野を持つように、スキナ内の光路中に配置される。シンボルから反射即ち散乱された光の部分が検出されて、電気信号に変換される。電気回路或いはソフトウェアは、この電気信号をスキナされたシンボルによって表わされるデータのデジタル表現にデコードする。例えば、フォトディテクタによって発生されたアナログ電気信号は、バーとスペースの物理的な幅に対応する幅を持つパルス幅変調デジタル信号に変換されることが出来る。そのようなデジタル信号は、次に、当該シンボルによって使用される特定のシンボル体系に基づいて、シンボルにエンコードされたデータのバイナリデータにデコードされ、その後、それが意味する英数字に変換される。

【0010】既知のバーコード読取システムに於けるデコード処理は、通常、以下のように行われる。デコードは、バーコード読取装置からパルス幅変調デジタル信号を受け、ソフトウェアで実行されるアルゴリズムがそのスキナをデコードするよう試みる。スタート及びストップキャラクターと、その間のキャラクターとが、そのスキナで完全にデコードされたならば、このデコード処理は終了されて、(緑のライト及び/又はビープ音のような)正しく読み取れたことを示す指示が使用者に提供される。或いは、デコードは、完全にデコードされたスキナが得られるまで、即ち、それ以上のスキナが得られなくなるまで、次のスキナを受けて、そのスキナに別のデコードを試みる。

【0011】そのような信号は次に、特定のシンボル体系に従って、シンボルに符号化されたデータのバイナリデータに、そして、それが意味する英数字に、デコードされる。

【0012】ビーム移動型レーザスキナは、バーコードシンボルを読み取ることができる光学装置の唯一の種類ではない。本発明に特に関連する別の種類のバーコード読取装置は、電荷結合素子(CCD)技術に基づいたディテクタを組み込んだものである。そのような従来の読取装置に於いては、通常、ディテクタの大きさが読み取るべきシンボルよりも大きいかほぼ同じ大きさである。シンボル全体に読取装置からの光が注がれ、各CCDセルが逐次読出されて、バー又はスペースの存在を決定する。そのような読取装置は、軽量であり簡単に使用できるが、シンボルを適切に読み取るように、読取装置をシンボルにほぼ直接接触させるか配置する必要がある。読取装置のシンボルへのそのような物理的な接触は、幾つかの応用のためには動作の好ましいモードであり、それどころか使用者による個人的な好みである。

【0013】CCDバーコードスキナの読み取り深度は、レーザ型のスキナに比較して非常に限られている。その理由は、例えばLED光源を持つCCD型のスキナのFナンバーがレーザスキナのFナンバーよりも非常に低いということによる。その結果として、Fナンバー

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の自乗に比例する読み取り深度は、そのようなCCD／LED型のスキャナのためには非常に低い。

【0014】CCD型のバーコードスキャナの他の特徴は、米国特許出願第317、553号（この内容は特開平2-268383号に開示されている）及び第717、771号に示されている。これらの出願は、従来のCCDスキャナに於ける技術的手法及び二次元シンボルを収集して読み取る方法を例示している。

【0015】

【発明が解決しようとする課題】しかしながら、前述したような特許及び特許出願に於いて示された従来の技術では、比較的安価なCCD型バーコードスキャナを使用して二次元バーコードシンボルを読み取るための簡単且つ比較的高率の良い手法がまだなかった。

【0016】本発明は上記の点に鑑みてなされたもので、比較的安価なCCD型バーコードスキャナを使用して二次元バーコードシンボルを読み取るための簡単且つ比較的高率の良い過程を提供することを目的とする。

【0017】

【課題を解決するための手段】上記の目的を達成するために、本発明によるシンボル情報読取方法は、読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったシンボルを含む視野をリニア光ディテクタアレイで光学的に撮像する第1のステップと、上記リニア光ディテクタアレイに照射する光に対応するバイナリデータをメモリに転送する第2のステップと、上記リニア光ディテクタアレイを移動させて、上記シンボルの別の行を撮像する第3のステップと、上記シンボルの全ての行が読み取られるまで、上記第1乃至第3のステップを繰り返す行う第4のステップと、上記シンボル中に含まれるバーコード情報を表わすデータ出力を生成する第5のステップとを備えることを特徴とする。

【0018】また、本発明によるシンボル情報読取装置は、読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったバーコードシンボル等を読み取るシンボル情報読取装置であって、上記シンボルを照明するための光源と、上記シンボルの一つの行を含む視野を持つ光ディテクタアレイと、上記光ディテクタアレイに照射する光に対応するバイナリデータをメモリに転送するための手段と、上記メモリ中の上記バイナリデータを上記シンボルの一つの行によって表わされるデータにデコードするための手段と、それぞれの行が読み取られるにつれ、上記シンボルのそれぞれの行によって表わされるデータを累積するためのメモリ手段と、シンボル全体のそれぞれの行が読み取られたことを決定し、上記シンボル中に含まれるバーコード情報を表わすデータ出力を生成するための手段とを備えることを特徴とする。

【0019】さらに、本発明による光電変換スキャナ

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は、異なる光反射率の部分を持つシンボルを読み取るための光電変換スキャナであって、ハウジングと、上記ハウジング内に搭載され、光ビームを発生してそれをその出射に沿って配向するための手段と、上記ハウジング内に搭載され、視野上の上記シンボルで反射された光を検出し、上記シンボルを表わす電気信号を発生するディテクタ手段と、上記ハウジング内に搭載され、上記外部へ出て行く光ビームをフォーカスするための第1の部分と、上記反射光を受けて上記ディテクタ手段にそれを向けるための第2の部分とを有するウィンドウ手段とを備えることを特徴とする。

【0020】

【作用】即ち、本発明のシンボル情報読取方法及び装置によれば、読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったシンボルを含む視野をリニア光ディテクタアレイで光学的に撮像し、上記リニア光ディテクタアレイに照射する光に対応するバイナリデータをメモリに転送する。そして、上記リニア光ディテクタアレイは移動されて、上記シンボルの別の行を撮像し、上記シンボルの全ての行が読み取られるまで、上記メモリ転送及び移動プロセスが繰り返される。そして、上記シンボル中に含まれるバーコード情報を表わすデータ出力が生成される。

【0021】また、本発明の光電変換スキャナは、全ての種類のバーコードスキャナに適用可能なウィンドウを有している。このウィンドウは、凸状の第1の部分により光源から放射された光ビームをシンボルに対してフォーカスして向け、平坦な第2の部分によりシンボルからの反射光を受けて、ハウジング内部のディテクタにそれを転送する。

【0022】なお、本明細書中に於いて使用される用語「シンボル」及び「バーコード」は、種々の幅の交互のバーとスペースの組み合わせられたパターンのみを意味するものではなく、英数字と同様に、他の一次元又は二次元のグラフィックパターンも包含するような広義の意味を持つものである。

【0023】本発明はまた、共に標準的なリニアバーコード、特に二次元バーコードである異なった2種類のバーコードを読み取ることができるバーコード読取システムを動作するための方法及び装置を提供する。本発明はまた、使用者がバーコードを垂直方向にスキャンさせて、適当なソフトウェアが二次元バーコードを一度に行わず読み取ってデコードできる技術を提供する。

【0024】

【実施例】以下、図面を参照して、本発明の実施例を説明する。図1の(A)は、本発明に従った第1実施例としての手持ち型のバーコード読取装置を非常に簡単に示す斜視図である。読取装置はまた、携帯型スキャナ中に組み込まれることができ、或いはバーコードラベルが読み取りヘッドを構成してスキャンされる卓上型ワー

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クステーションや定置型スキャナのようなものにも組み込むことができる。本実施例に於いては、読取装置は手持ち型の軽便プラスチックハウジング100中に組み込まれている。このハウジング100は、商品103等に貼付されたラベル102上に印刷されたバーコード101と接触するよう使用者によって手作業で配置される。

【0025】図1の(B)は、本発明の装置で読み取られるべきPDF417フォーマットの二次元バーコードシンボル104を示している。PDF417シンボルは、バーコード化された情報の行のスタックより成る。このシンボルの各行は、スタートパターン、「コードワード」と呼ばれる幾つかのシンボルキャラクタ、及びストップパターンからなっている。コードワードは、或る数値や文字、又は別のシンボルを表わす、或いは関連する値を符号化するための基礎単位である。ひとまとめで、各行のコードワードはデータ列を形成する。

【0026】PDF417シンボルの行の数及び列の数は両方とも可変である。このシンボルは、少なくとも3行なければならず、90行までを持つことができる。同様に、各行中のコードワード即ちデータ列の数は、3列から30列まで変えることができる。

【0027】PDF417に於ける各コードワードは、17個のモジュール即ち単位からなる。各コードワードには、4個のバーと4個のスペースがある。個々のバー又はスペースは、1個のモジュールから6個のモジュールまで幅が変化することができるが、しかし、コードワード当たりの組み合わせられた総数は常に17モジュールである。従って、各コードワードは、コードワード内の交互のバー及びスペースの幅の4組のセットを表わす8桁のシーケンスによって定義されることができる。これは、コードワードの「xシーケンス」と呼ばれ、シーケンス x_0, x_1, \dots, x_7 によって表わされることができる。例えば、「51111125」のxシーケンスの場合、第1の要素は5モジュール幅であり、次に1モジュール幅の要素が5個続き、次の1個の要素が2モジュール幅であり、最後の要素が5モジュール幅である。

【0028】可能なコードワードのセットは、さらに「クラスタ」と呼ばれる3個の相互に排他的なサブセットに分割される。PDF417シンボルでは、それぞれ行はデータを符号化するためにこれら3個のクラスタの内の一つのみを使用し、それぞれのクラスタは3行毎に逐次繰り返される。どの2個の隣接する行も異なったクラスタを使用するので、デコーダは、スキャンラインが各行と正確に整列されずに、スキャンラインがスキャンの間に或る行から別の2つの行と交差するような場合を、この異なった行からのコードワードの存在によって識別することができる。

【0029】コードワードのクラスタ番号は、以下の式を使用してそのxシーケンスから決定されることができ

る。即ち、

クラスタ番号 = $(x_0 - x_2 + x_4 - x_6) \bmod 9$
ただし、「mod 9」は9で割った後の余りのことである。上記例のコードワードのxシーケンスでは、クラスタ番号は、

クラスタ番号 = $(5 - 1 + 1 - 2) \bmod 9 = 3$
のように計算される。

【0030】エラー確率を最小にするために、PDF417は、9個のクラスタを使用することが数学的に可能であるとはいえ、3個のクラスタのみを使用している。従って、それぞれの行は、3個のクラスタ0、3、又は6の内の一つのみを使用して、3行毎に逐次繰り返す同じクラスタを持つデータを符号化する。例えば、行0コードワードはクラスタ0を使用し、行1はクラスタ3を使用し、行2はクラスタ6を使用する。一般的には、クラスタ番号は、

クラスタ番号 = $((\text{行番号}) \bmod 3) * 3$

のように、行番号から決定されることができる。

【0031】PDF417に於いては、929個のコードワード値が定義されている。これらの値は0乃至928である。各クラスタは、或るクラスタが別のクラスタと混同されることができないように、別個のバーとスペースのパターンを持った929個の利用可能な値を表わす。

【0032】図1の(C)は、本発明の第1実施例に従ったバーコード読取装置の発光及び受光素子を非常に簡単に示す斜視図である。発光ダイオード（又は発光ダイオードのアレイ）のような光源105及びフォーカス用レンズ106（又はそのようなレンズのアレイ）は、みなぎる光で視野を、理想的には狭い矩形パターンで、照明するために使用される。

【0033】読取装置は、シンボル104の少なくとも1行全体が完全に照明されるように、バーコードシンボル104上方に位置決めされる。反射された即ち分散された光は、集光光学系107を介して読取装置に戻され、リニアフォトダイオードアレイ108即ちイメージセンサに展される。

【0034】フォトダイオードアレイは、バーコードシンボルの行を表わす画像を電気信号に変換する。図2の(C)に示されるような本発明のブロック図と共に後述されるように、この電気信号はデコードされ（或いは、デコードされるよう試みられ）、その結果が次の画像及び信号処理に利用される。

【0035】本発明がスタックドバーコード即ち二次元バーコードを読み取るためのCCD読取装置に主に関与するものであるとはいえ、本発明の一つの任意の特徴はまた、レーザスキャンバーコード読取装置に於いても使用されることができ、この場合を本発明の第2実施例として図2の(A)に示す。

【0036】即ち、図2の(A)は、バーコード読取装

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置のレーザスキャンの例に於けるハウジング100の前面部109の非常に簡略化した断面図であり、光源110と、平坦な上部112と凸状下部113を持つウィンドウ111とが示されている。光ディテクタ114は、上部112を通過して光が照射されて、その反射光が下部113を通るように、下部113の後ろ側に配置されている。同図に示されるように、読み取られるべきシンボルと接触することによって典型的に使用されるCCD読取装置中のレンズを適当な位置に設けるために、ウィンドウ111は、当該スキャナの前部の非常に近くに置かれる。

【0037】同図の例は、信号レベルを増し、ディテクタの視野を狭くすることによって回りの光を取り除くのに役立つように、フォトセンサの前に固定レンズを必要とする無逆反射型のレーザスキャンバーコード読取装置のために特に利用される。

【0038】図2の(B)は、本発明の第3実施例に於ける長い筒状レンズを有する多目的ウィンドウを組み込んだバーコード読取装置の正面図である。同図は、レーザスキャンバーコード読取装置もしくはCCD読取装置を覗くことができる。CCD読取装置の場合には、ウィンドウ111の凸状下部113は典型的に、ディテクタよりはむしろ光源の前面にあり、光源は、そのような下部113によって、フォーカスされる目標距離でバーコードの行に平行に強い線状照明を形成する。

【0039】どちらの種類のバーコード読取装置も、はこりから守るためのウィンドウを必要とし、これはまた光学フィルタであることが望ましい。それらの機能の両方ともウィンドウの形でたった一つの成形プラスチック部によって提供されることができる。

【0040】要約すると、本発明の特徴の一つは、レンズを形成する一つ以上の部分を持つウィンドウを利用することである。そのようなレンズは、バーコード読取装置の種類及びその動作要求に従って、光源、光ディテクタ、もしくはその両方の前面に配置されることができる。

【0041】このウィンドウは、レンズとして働くのに加えて、光フィルタのように働くようにもまた機能するように、赤いプラスチックで成形されることができる。このウィンドウは、好ましくは、出射光ビームが通過する平坦部と、フォトディテクタ上にシンボルから反射された光をフォーカスするためのレンズ状部を持つ。ウィンドウ中に形成されたレンズは、スキャナ要求に従って筒状又は球面であることができ、例えば、多数球面レンズのパターンがそれぞれのディテクタ上に反射光をフォーカスするために使用されることができ、或いは、多数ディテクタと共にたった一つの長い筒状レンズが使用されることができる。

【0042】図2の(C)は、本発明に従ったCCDバーコードスキャナの電子部分のブロック図を示してい

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る。イメージセンサ114は、当該ディテクタの視野の画像を得るためのピックアップとして機能する。このイメージセンサ114からの電気信号は、転送ゲート115に供給され、次に、シフトフィルタ116に供給される。このシフトレジスタ116は、バス118にインターフェースする出力回路117を持っている。バス118は、メモリ119、CPU120、及びインターフェース121を含むバーコード読取装置部のコンピュータ部のための主データバスである。

【0043】本発明が一次元又は二次元バーコードを読み取ることに限られていないとはいえ、そのような実施例に限定されるものではなく、より複雑なシンボルスキャン応用にもまた適用できる。本発明の方法はまた、文字或いはスキャンされる商品などの表面特徴から情報が得られる種々の機械読取又は光学式文字認識応用の使用のための適用を見いだすことができる。

【0044】種々の態様のすべてに於いて、スキャナの各素子は、たった一つの印刷回路基板又は集積モジュールとして製造されることをスキャナに許す非常にコンパクトなパッケージ中に組み立てられることができる。そのようなモジュールは、多種多様の異なった種類のデータ収集システムのためのレーザスキャン素子として、交換可能に使用されることができる。例えば、このモジュールは、手持ち式スキャナに於いて、或いはフレキシブルアームに取り付けられた又はテーブルの表面上に搭載した又はテーブル上面の裏面に取り付けられた卓上型スキャナに於いて代替使用されることができ、或いは、より複雑化されたデータ収集システムのサブコンポーネント又はサブアセンブリとして搭載されることができる。

【0045】このモジュールは、支持部上にサブアセンブリ的に搭載された光学系と、フォトディテクタコンポーネントとを含むことが好ましい。そのようなコンポーネントと関連する制御ライン及びデータラインは、当該モジュールのエッジ又は外部表面上に搭載された電気コネクタに接続されて、当該モジュールを、データ収集システムの他の素子と関連するマッチングコネクタに電気的に接続されることを許す。

【0046】個々のモジュールは、それに関連する特定のスキャン及びデコード特性、例えば、或る作業距離での実施可能性、又は特定のシンボル又は印刷密度での実施可能性を持つことができる。この特性はまた、当該モジュールと関連する制御スイッチのマニュアルセッティングを通して定義されることができる。使用者はまた、このデータ収集システムに、異なる種類の商品などをスキャンするよう適用し、システムは、簡単な電気コネクタの使用を通してデータ収集システム上の相互交換モジュールによって異なった適用のために適用されることができる。

【0047】前述されたスキャンモジュールはまた、キーボード、ディスプレイ、プリンタ、データ記憶装置、

DOCUMENT 1/1
DOCUMENT NUMBER
@: unavailable

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アプリケーションソフトウェア、及びデータベースのよう
な一つ以上のコンポーネントを含む自給式のデータ取
集システム内に実行されることができる。そのようなシ
ステムはまた、データ収集システムにローカルエリアネ
ットワークの他のコンポーネントと、或いは、モデムか
或いはISDNインターフェースかを介して、もしくは
ポータブル端末から固定受信器への低出力ラジオ放送に
よって、電話交換網と通信することを許す通信インター
フェースを含むことができる。

【0048】前述の特徴のそれぞれ、又は2つもしくは
それ以上は、他の種類のスキャナ及び前述の種類と異な
るバーコード読取装置に於ける利用できる応用を見いだ
すことができるということが理解されるだろう。

【0049】以上本発明の実施例を説明したが、本発明
はこれに限定されるものではなく、本発明の精神から逸
脱すること無しに種々の変形及び構造的な変更がなされ
ることができることは勿論である。例えば、CCDの代
わりに他の固定撮像素子（例えばCMOS）を用いても良
い。

【0050】なお、本発明の上記実施態様によれば以下
のごとき構成が得られる。

(1) バーコードシンボル等を読み取るシンボル情報
読取方法に於いて、読み取られるべきバーコード情報の
複数のコードワードを持つ行が隣接して配置された複数
次元を持ったシンボルを含む視野をリニア光ディテクタ
アレイで光学的に撮像する第1のステップと、上記リニア
光ディテクタアレイに衝突する光に対応するバイナリ
データをメモリに転送する第2のステップと、上記リニア
光ディテクタアレイを移動させて、上記シンボルの別の
行を撮像する第3のステップと、上記シンボルの全ての
行が読み取られるまで、上記第1乃至第3のステップ
を繰り返し行う第4のステップと、上記シンボル中に含
まれるバーコード情報を表わすデータ出力を生成する第
5のステップと、を具備することを特徴とするシンボル
情報読取方法。

【0051】(2) それぞれの行が撮像されるよう
に、一行毎に上記バーコードシンボルの行に於いて表わ
されたデータに、上記メモリに格納されたバイナリデー
タをデコードするステップをさらに具備することを特徴
とする(1)に記載の方法。

【0052】(3) 上記第1のステップは、上記視野
上に光を向けるステップと、上記リニア光ディテクタア
レイ上に反射光を集めるステップとを含むことを特徴と
する(1)に記載の方法。

【0053】(4) 上記光を向けるステップは、発
光ダイオード光源を利用することを特徴とする
(3)に記載の方法。

(5) 上記光を向けるステップは、半導体レーザダイ
オード光源を利用することを特徴とする

(3)に記載の方法。

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【0054】(6) 上記リニア光ディテクタアレイは
CCDデバイスであり、上記第2のステップは上記リニア
光ディテクタアレイを連続的にアクセスすることを含
むことを特徴とする(1)に記載の方法。

【0055】(7) 上記第3のステップは、垂直方向
にバーコードシンボルをスイープすることにより使用者
によってマニュアルで行われることを特徴とする(1)
に記載の方法。

【0056】(8) 読み取られるべきバーコード情報
の複数のコードワードを持つ行が隣接して配置された複
数次元を持ったバーコードシンボル等を読み取るシンボ
ル情報読取装置に於いて、上記シンボルを照明するため
の光源と、上記シンボルの一つの行を含む視野を持つ光
ディテクタアレイと、上記光ディテクタアレイに衝突す
る光に対応するバイナリデータをメモリに転送するため
の手段と、上記メモリ中の上記バイナリデータを上記シ
ンボルの一つの行によって表わされるデータにデコード
するための手段と、それぞれの行が読み取られるにつ
れ、上記シンボルのそれぞれの行によって表わされるデ
ータを累積するためのメモリ手段と、シンボル全体のそ
れぞれの行が読み取られたことを決定し、上記シンボル
中に含まれるバーコード情報を表わすデータ出力を生成
するための手段と、を具備することを特徴とするシンボ
ル情報読取装置。

【0057】(9) 上記光源は、発光ダイオードのア
レイを含むことを特徴とする(8)に記載の装置。

(10) 上記光ディテクタアレイはCCDデバイスで
あることを特徴とする(8)に記載の装置。

【0058】(11) 異なる光反射率の部分を持つシ
ンボルを読み取るための光電変換スキャナに於いて、ハ
ウジングと、上記ハウジング内に搭載され、光ビームを
発生してそれをその出路に沿って配向するための手段
と、上記ハウジング内に搭載され、視野上の上記シンボ
ルで反射された光を検出し、上記シンボルを表わす電気
信号を発生するディテクタ手段と、上記ハウジング内に
搭載され、上記外部へ出て行く光ビームをフォーカスす
るための第1の部分と、上記反射光を受けて上記ディテ
クタ手段にそれを向けるための第2の部分とを有するウ
ィンドウ手段と、を具備することを特徴とする光電変換
スキャナ。

【0059】(12) 上記光ビームを発生する手段
は、LEDアレイであることを特徴とする(11)に記載
の光電変換スキャナ。

(13) 上記光ビームを発生する手段は、レーザダイ
オードアレイであることを特徴とする(11)に記載の
光電変換スキャナ。

【0060】(14) 上記ウィンドウ手段は、上記ハ
ウジングの前部に搭載された単一のウィンドウであるこ
とを特徴とする(11)に記載の光電変換スキャナ。

(15) 上記ディテクタ手段は、CCDデバイスであ

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アプリケーションソフトウェア、及びデータベースのようないつ以上のコンポーネントを含む自給式のデータ収集システム内に実行されることができる。そのようなシステムはまた、データ収集システムにローカルエリアネットワークの他のコンポーネントと、或いは、モデムか或いはISDNインターフェースかを介して、もしくはポータブル端末から固定受信器への低出力ラジオ放送によって、電話交換網と通信することを許す通信インターフェースを含むことができる。

【0048】前述の特徴のそれぞれ、又は2つもしくはそれ以上は、他の種類のスキャナ及び前述の種類と異なるバーコード読取装置に於ける利用できる応用を見いだすことができるということが理解されるだろう。

【0049】以上本発明の実施例を説明したが、本発明はこれに限定されるものではなく、本発明の精神から逸脱すること無しに種々の変形及び構成的な変更がなされることができることは勿論である。例えば、CCDの代わりに他の固定撮像素子（例えばCMOS）を用いても良い。

【0050】なお、本発明の上記実施態様によれば以下のごとき構成が得られる。

(1) バーコードシンボル等を読み取るシンボル情報読取方法に於いて、読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったシンボルを含む視野をリニア光ディテクタアレイで光学的に撮像する第1のステップと、上記リニア光ディテクタアレイに衝突する光に対応するバイナリデータをメモリに転送する第2のステップと、上記リニア光ディテクタアレイを移動させて、上記シンボルの別の行を撮像する第3のステップと、上記シンボルの全ての行が読み取られるまで、上記第1乃至第3のステップを繰り返して行う第4のステップと、上記シンボル中に含まれるバーコード情報を表わすデータ出力を生成する第5のステップと、を具備することを特徴とするシンボル情報読取方法。

【0051】(2) それぞれの行が撮像されるように、一行毎に上記バーコードシンボルの行に於いて表わされたデータに、上記メモリに格納されたバイナリデータをデコードするステップをさらに具備することを特徴とする(1)に記載の方法。

【0052】(3) 上記第1のステップは、上記視野上に光を向けるステップと、上記リニア光ディテクタアレイ上に反射光を集めるステップとを含むことを特徴とする(1)に記載の方法。

【0053】(4) 上記光を向けるステップは、発光ダイオード光源を利用することを特徴とする(3)に記載の方法。

(5) 上記光を向けるステップは、半導体レーザダイオード光源を利用することを特徴とする(3)に記載の方法。

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【0054】(6) 上記リニア光ディテクタアレイはCCDデバイスであり、上記第2のステップは上記リニア光ディテクタアレイを連続的にアクセスすることを含むことを特徴とする(1)に記載の方法。

【0055】(7) 上記第3のステップは、垂直方向にバーコードシンボルをスワイプすることにより使用者によってマニュアルで行われることを特徴とする(1)に記載の方法。

【0056】(8) 読み取られるべきバーコード情報の複数のコードワードを持つ行が隣接して配置された複数次元を持ったバーコードシンボル等を読み取るシンボル情報読取装置に於いて、上記シンボルを照明するための光源と、上記シンボルの一つの行を含む視野を持つ光ディテクタアレイと、上記光ディテクタアレイに衝突する光に対応するバイナリデータをメモリに転送するための手段と、上記メモリ中の上記バイナリデータを上記シンボルの一つの行によって表わされるデータにデコードするための手段と、それぞれの行が読み取られるにつれ、上記シンボルのそれぞれの行によって表わされるデータを累積するためのメモリ手段と、シンボル全体のそれぞれの行が読み取られたことを決定し、上記シンボル中に含まれるバーコード情報を表わすデータ出力を生成するための手段と、を具備することを特徴とするシンボル情報読取装置。

【0057】(9) 上記光源は、発光ダイオードのアレイを含むことを特徴とする(8)に記載の装置。

(10) 上記光ディテクタアレイはCCDデバイスであることを特徴とする(8)に記載の装置。

【0058】(11) 異なる光反射率の部分を持つシンボルを読み取るための光電変換スキャナに於いて、ハウジングと、上記ハウジング内に搭載され、光ビームを発生してそれをその出路上に沿って配向するための手段と、上記ハウジング内に搭載され、視野上の上記シンボルで反射された光を検出し、上記シンボルを表わす電気信号を発生するディテクタ手段と、上記ハウジング内に搭載され、上記外部へ出て行く光ビームをフォーカスするための第1の部分と、上記反射光を受けて上記ディテクタ手段にそれを向けるための第2の部分とを有するウィンドウ手段と、を具備することを特徴とする光電変換スキャナ。

【0059】(12) 上記光ビームを発生する手段は、LEDアレイであることを特徴とする(11)に記載の光電変換スキャナ。

(13) 上記光ビームを発生する手段は、レーザダイオードアレイであることを特徴とする(11)に記載の光電変換スキャナ。

【0060】(14) 上記ウィンドウ手段は、上記ハウジングの前部に搭載された単一のウィンドウであることを特徴とする(11)に記載の光電変換スキャナ。

(15) 上記ディテクタ手段は、CCDデバイスであ

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ることを特徴とする(11)に記載の光電変換スキャナ。

【0061】

【発明の効果】以上詳述したように、本発明によれば、比較的安価なCCD型バーコードスキャナを使用して二次元バーコードシンボルを読み取るための簡単且つ比較的高能率の良い手法を提供することができる。

【図面の簡単な説明】

【図1】(A)はバーコードを読み取るための本発明の第1実施例に於ける光学スキャンシステムの斜視図、(B)は二次元バーコードシンボルの例としてPDF-417コード体系のバーコードラベルを示す図であり、(C)は本発明の第1実施例に於けるバーコード読取装置の発光及び受光素子の非常に簡略化した概略斜視図である。

【図2】(A)は本発明の第2実施例に於ける多目的ウィンドウを組み込んだレーザスキャンバーコードスキャナ

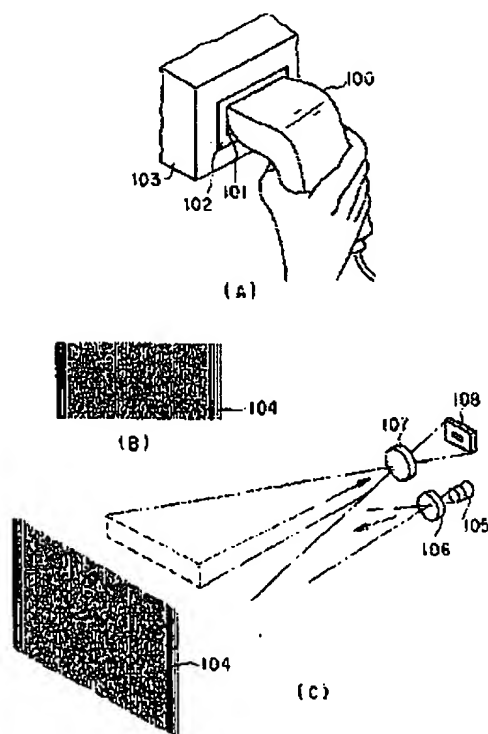
14

*ナのノーズ部分即ち先端部の断面図、(B)は本発明の第3実施例に於ける多目的ウィンドウを組み込んだバーコードスキャナの正面図であり、(C)は本発明に従ったバーコードスキャナの非常に簡略化したブロック図である。

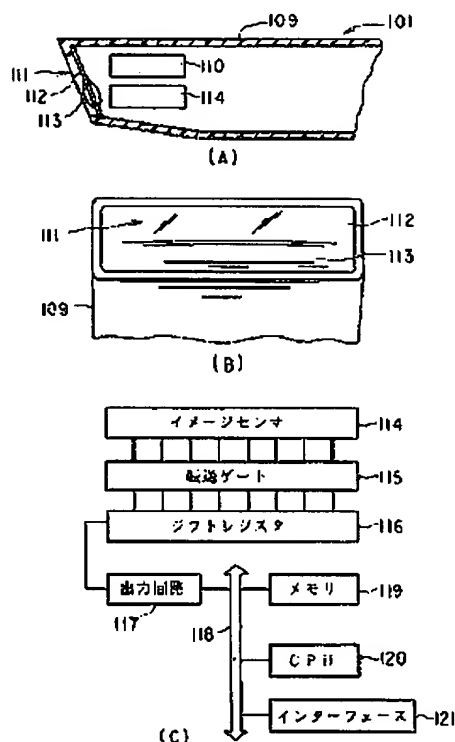
【符号の説明】

100…手持ち型の軽質プラスチックハウジング、101…バーコード、102…ラベル、103…商品、104…PDF417フォーマットの二次元バーコードシンボル、105…光源、106…フォーカス用レンズ、107…集光光学系、108…リニアフォトダイオードアレイ、109…ハウジング前部、110…光源、111…ウィンドウ、112…ウィンドウの平坦上部、113…ウィンドウの凸状下部、114…光ディテクタ(イメージセンサ)、115…転送ゲート、116…シフトレジスタ、117…出力回路、118…バス、119…メモリ、120…CPU、121…インターフェース。

【図1】



【図2】



(9)

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23

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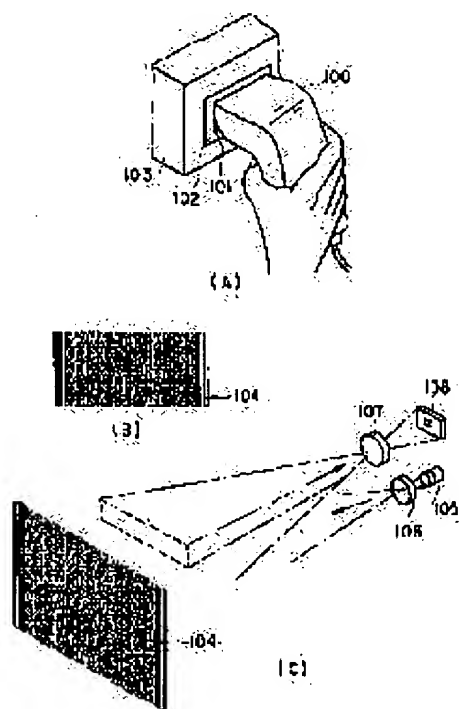
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(54) METHOD AND DEVICE FOR READING SYMBOL INFORMATION, AND PHOTOELECTRIC CONVERSION SCANNER

(57)Abstract:

PURPOSE: To provide the method being simple, and also, having a comparatively high efficiency, for reading a two-dimensional bar-code symbol by using a comparatively inexpensive CCD type bar-code scanner.

CONSTITUTION: A field of view containing a two-dimensional bar-code symbol 104 is picked up optically by a linear photodiode array 108, and binary data corresponding to light which comes into collision with the linear photodiode array 108 is transferred to a memory. Subsequently, the linear photodiode array 108 is moved, another line of the symbol 104 is picked up, and until all lines of the symbol 104 are read, the memory transfer and the moving process are repeated. A data output for showing bar-code information container in the symbol 104 is also generated.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The 1st step which picturizes optically the visual field containing a symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged by linear light detector AREI, The 2nd step which transmits the binary data corresponding to the light which collides with said linear light detector rhe to memory, Until the 3rd step which is made to move said linear light detector rhe, and picturizes another line of said symbol, and all the lines of said symbol are read The symbol information reading approach characterized by providing the 4th step performed by repeating said 1st [the] thru/or the 3rd step, and the 5th step which generates the data output showing the bar code information included in said symbol.

[Claim 2] The light source for illuminating said symbol in the symbol information reader which reads a bar code symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged, An optical detector rhe with the visual field containing one line of said symbol, and the means for transmitting the binary data corresponding to the light which collides with said optical detector rhe to memory, The means for decoding said binary data in said memory to the data expressed by one line of said symbol, The memory means for accumulating the data expressed by each line of said symbol as each line is read, The symbol information reader characterized by providing the means for generating the data output showing the bar code information which determines that each line of the whole symbol was read and is included in said symbol.

[Claim 3] In the photo-electric-conversion scanner for reading a symbol with the part of a different rate of a light reflex Housing, The means for being carried in said housing, generating a light beam, and carrying out orientation of it along with the Deji, A detector means to generate the electrical signal with which it is carried in said housing, the light reflected as said symbol on a visual field is detected, and said symbol is expressed, The photo-electric-conversion scanner characterized by providing a window means to have the 1st part for carrying out the focus of the light beam which it is carried in said housing and left to said exterior, and the 2nd part for turning it to said detector means in response to said reflected light.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to what reads a stacked bar code, i.e., a two dimensions bar code, especially using an individual image sensor technique about the photo-electric-conversion scanner used for the symbol information reading approach, the equipment, and it which carry out photo electric conversion of the symbol which has generally the part from which rates of a light reflex, such as a bar code, differ, and read it.

[0002]

[Description of the Prior Art] In recent years, the optical reader and optical scanner system which read the bar code symbol soon formed in front faces, such as a label stuck on front faces, such as goods, or its goods, have been developed variously. A bar code symbol is a symbol constituted with a series of bars which have the various width of face which consists of a bar and a tooth space with a mutually different light reflex property, opened spacing mutually by the tooth space between various width of face, and has been arranged. The above-mentioned reader and a scanner system carry out photo electric conversion of the graphical symbol to an electric signal, and decode it to the alphanumeric characters meaning the description of explanation of the goods concerned or some of goods concerned. Such an alphanumeric alphabetic character is usually expressed by digital data, is used as an input to data processing system, and is applied to POS (point OBU sales = point-of-sales system) processing, stock control, etc. This kind of common scanner system is indicated by for example, a U.S. Pat. No. 4,251,798 specification, a U.S. Pat. No. 4,369,361 specification, the U.S. Pat. No. 4,387,297 specification, the U.S. Pat. No. 4,409,470 specification, the U.S. Pat. No. 4,760,248 specification, the U.S. Pat. No. 4,896,026 specification, etc.

[0003] As one gestalt of such a scanner system, there is a hand-held pocket mold laser scanner head, and when a user has by hand, this is taken as the configuration which can aim the head concerned, especially a laser beam at the target and symbol which should be read, as indicated by some of these United States patents.

[0004] Although it is common that gas laser and semiconductor laser are used as for the light source in a laser scanner bar code reader, it is desirable to use a semiconductor device especially as the light source in a scanner system especially from the small thing, that it is a low price, and the point of low power consumption. The optical member for focuses is optically deformed by the laser beam, and it usually makes the beam spot of predetermined magnitude from target distance by it. As for the magnitude of the beam spot in this target distance, it is desirable that it is almost the same as the minimum width of face between the fields where the rates of a light reflex differ (i.e., between the bar of a symbol and tooth spaces).

[0005] A bar code symbol is formed from the element of a bar, i.e., the rectangle configuration which can have various width of face. The specific array of such an element defines a character and this is expressed according to the set of the regulation determined, the code, i.e., a "symbol system", used, and a definition. The relative magnitude of a bar and a tooth space is determined by the class of code used, and is similarly determined by the class of code for which the actual size of a bar and a tooth space is

also used. The number of the characters of per 1 inch (2.54cm) expressed by the bar code symbol is called the consistency of a symbol. In order to encode a series of alphabetic characters of a wish, the array of an element expressed by the element of the group to whom each alphabetic character of the message corresponds in itself is tied up in both sets, and a perfect bar code symbol is formed. In some symbol systems, peculiar "start" and "stop" character which show the starting position and termination location of the bar code are used. There is a bar code symbol system from which current and a large number differed, and a UPC/EAN code, CODE39 and CODE128, CODABAR (NW-7), the ITF (Interleaved 2 of 5) code, etc. are known.

[0006] The character which is not recognized to be a just character according to the symbol system again, and is not defined in the character which is recognized according to a symbol system and defined here for the following explanation shall be called an abnormality character. Therefore, the array of the element which cannot be decoded according to a certain symbol system is equivalent to the abnormality character for the symbol system concerned.

[0007] Since amount of information recordable [are shown on the surface field of predetermined magnitude, i.e.,] is increased, the new bar code symbol of recent years some has been developed. CODE49 which is 1 ** standard [those / new] for a code has drawn the concept of "2-dimensional one" by accumulating the train of a character perpendicularly instead of extending a bar horizontally. That is, there are some lines of a bar and the pattern of a tooth space instead of only one line. The structure of this CODE49 is indicated by the U.S. Pat. No. 4,794,239 specification. Moreover, another structure known as "PDF417" is discussed by the United States patent application No. 461,881.

[0008] In a scanner system known in the field concerned, a light beam is turned to the target containing a bar code symbol by the lens or the same optical element arranged on an optical path on the front face. By motion of a scan component like the mirror arranged in the path of a light beam, a light beam crosses a symbol and the scanner of a beam migration mold operates by making a party or a series of multi-lines repeat and scan. A symbol is crossed, the sweep of the beam spot is carried out, it reaches and the above-mentioned scan component traces the scan line which crosses a symbol and through which it passes, or the sweep of the visual field of a scanner is carried out, and it is scanned. Or the sweep of both of visual fields of a scanner may be carried out to the beam spot.

[0009] The bar code reading system contains, the sensor, i.e., the photodetector, which functions as detecting the light which it was reflected from the symbol, i.e., was scattered about again. A photodetector, i.e., a sensor, is arranged in the optical path in a scanner so that it may have a visual field slightly larger than full [of a symbol]. The part of the light reflected namely, scattered about from the symbol is detected, and it is changed into an electrical signal. An electrical circuit or software is decoded to the digital representation of data with which it is expressed by the symbol which had this electrical signal scanned. For example, the analog electrical signal generated by the photodetector is convertible for a pulse-width-modulation digital signal with the width of face corresponding to the physical width of face of a bar and a tooth space. Such a digital signal is decoded by the binary data of the data encoded by the symbol next based on the specific symbol system used by the symbol concerned, and is changed into the alphanumeric alphabetic character which it means after that.

[0010] As decoding in a known bar code reading system is the following, it is usually performed. A decoder receives a pulse-width-modulation digital signal from a bar code reader, and it tries it so that the algorithm performed by software may decode the scan. If a start and a stop character, and a character in the meantime are completely decoded with that scan, this decoding will be finished and a user will be provided with the directions which show that it was able to read correctly (it is (like a green light and/or a beep sound)). Or a decoder tries another decoding on the scan in response to the next scan until the scan decoded completely is reached (i.e., until the scan beyond it is no longer obtained).

[0011] Next, such a signal is decoded by the binary data of the data encoded by the symbol according to the specific symbol system, and the alphanumeric alphabetic character which it means.

[0012] A beam migration mold laser scanner is not the only class of optical equipment which can read a bar code symbol. The bar code reader of another class especially relevant to this invention incorporates the detector based on a charge-coupled-device (CCD) technique. In such a conventional reader, it is

[whether it is usually larger than the symbol which the magnitude of a detector should read, and] the almost same magnitude. The whole symbol is filled with the light from a reader, each CCD cel is read serially, and existence of a bar or a tooth space is determined. Although such a reader can be used that it is lightweight and easily, it needs to arrange whether a reader is mostly contacted as a symbol directly so that a symbol can be read appropriately. Such physical contact to the symbol of a reader is the mode in which actuation is desirable for some application, and is the individual liking by the user, not to mention it.

[0013] The reading depth of a CCD bar code scanner is restricted very much as compared with the scanner of a laser mold. The reason is because the f number of the scanner of a CCD mold with for example, the LED light source is very lower than the f number of a laser scanner. As the result, the reading depth proportional to the square of the f number is very low for the scanner of such a CCD/LED mold.

[0014] Other descriptions of the bar code scanner of a CCD mold are shown in the United States patent application No. (these contents are indicated by JP,2-268383,A) 317,553 and No. 717,771. These applications have illustrated the approach of collecting and reading the conventional engineering practice and conventional 2-dimensional symbol in a CCD scanner.

[0015]

[Problem(s) to be Solved by the Invention] However, at the Prior art shown in a patent and patent application which were mentioned above, there were still no easy and comparatively efficient technique for reading a 2-dimensional bar code symbol using a comparatively cheap CCD mold bar code scanner.

[0016] This invention was made in view of the above-mentioned point, and aims at easy and offering a comparatively efficient weekly report for reading a 2-dimensional bar coat symbol using a comparatively cheap CCD mold bar code scanner.

[0017]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the symbol information reading approach by this invention The 1st step which picturizes optically the visual field containing a symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged by linear light detector AREI, The 2nd step which transmits the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe to memory, Until the 3rd step which is made to move the above-mentioned linear light detector rhe, and picturizes another line of the above-mentioned symbol, and all the lines of the above-mentioned symbol are read It is characterized by having the 4th step performed by repeating the above 1st thru/or the 3rd step, and the 5th step which generates the data output showing the bar code information included in the above-mentioned symbol.

[0018] Moreover, the symbol information reader by this invention The light source for being the symbol information reader which reads a bar code symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged etc., and illuminating the above-mentioned symbol, An optical detector rhe with the visual field containing one line of the above-mentioned symbol, and the means for transmitting the binary data corresponding to the light which collides with the above-mentioned optical detector rhe to memory, The means for decoding the above-mentioned binary data in the above-mentioned memory to the data expressed by one line of the above-mentioned symbol, The memory means for accumulating the data expressed by each line of the above-mentioned symbol as each line is read, It determines that each line of the whole symbol was read, and is characterized by having a means for generating the data output showing the bar code information included in the above-mentioned symbol.

[0019] The photo-electric-conversion scanner by this invention is a photo-electric-conversion scanner for reading a symbol with the part of a different rate of a light reflex. Furthermore, housing, The means for being carried in the above-mentioned housing, generating a light beam, and carrying out orientation of it along with the Deji, A detector means to generate the electrical signal with which it is carried in the above-mentioned housing, the light reflected as the above-mentioned symbol on a visual field is detected, and the above-mentioned symbol is expressed, It is carried in the above-mentioned housing

and characterized by having a window means to have the 1st part for carrying out the focus of the light beam left to the above-mentioned exterior, and the 2nd part for turning it to the above-mentioned detector means in response to the above-mentioned reflected light.

[0020]

[Function] That is, the visual field containing a symbol with two or more dimensions by which the line which has two or more codewords of the bar code information which should be read according to the symbol information reading approach and equipment of this invention adjoined, and has been arranged is optically picturized by the linear light detector rhe, and the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe are transmitted to memory. And the above-mentioned memory transfer and a migration process are repeated until the above-mentioned linear light detector rhe is moved, it picturizes another line of the above-mentioned symbol and all the lines of the above-mentioned symbol are read. And the data output showing the bar code information included in the above-mentioned symbol is generated.

[0021] Moreover, the photo-electric-conversion scanner of this invention has the window applicable to the bar code scanner of all classes. To a symbol, this window carries out the focus of the light beam emitted from the light source by the 1st convex part, turns it, and transmits it to the detector inside housing in response to the reflected light from a symbol by the 2nd flat part.

[0022] In addition, the vocabulary "the symbol" and the "bar code" which are used into this specification do not mean only the pattern with which the mutual bar of various width of face and the tooth space were put together, and have the semantics of a wide sense which also includes other single dimensions or a 2-dimensional graphic pattern like an alphanumeric alphabetic character.

[0023] Again both this inventions offer the approach and equipment for operating the bar code reading system which can read two kinds of different bar codes which are a standard linear bar code, especially a two dimensions bar code. A user makes the sweep of the bar code carry out perpendicularly, and this invention offers the technique in which suitable software reads a two dimensions bar code a party every at once, and can decode it again.

[0024]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. (A) of drawing 1 is the perspective view in which simplifying very much and showing the bar code reader of the stock mold as the 1st example according to this invention. A reader is incorporable into a pocket mold scanner, or a bar code label can read it and it can be built also into a thing like the table-top-type workstation by which crosses a head and a sweep is carried out, or a fixed mold scanner again. In this example, the reader is incorporated into the lightweight plastics housing 100 of a stock mold. This housing 100 is manually arranged by the user so that the bar code 101 printed on the label 102 stuck on the goods 103 grade may be contacted.

[0025] (B) of drawing 1 shows the 2-dimensional bar code symbol 104 of the PDF417 format which should be read with the equipment of this invention. PDF417 symbol consists of the stack of the line of the bar-code-ized information. Each line of this symbol consists of a start pattern, some symbol characters called a "codeword", and a stop pattern. A codeword is a building block for expressing a certain numeric value and alphabetic character, or another symbol, or encoding a related value. Making it a bundle, the codeword of each line forms a data stream.

[0026] Both the number of the lines of PDF417 symbol and the number of trains are adjustable. if this symbol does not have at least three lines, it will not become, but it can have even 90 lines. Similarly, the codeword in each line, i.e., the number of data streams, is changeable from three trains to 30 trains.

[0027] Each codeword in PDF417 consists of 17 modules, i.e., a unit. There are four bars and four tooth spaces in each codeword. Although each bar or tooth space can change width of face from one module even to six modules, the totals with which per codeword was combined are always 17 modules.

Therefore, each codeword can be defined by the sequence showing 4 sets of sets of the mutual bar in a codeword, and the width of face of a tooth space of 8 figures. It is called "x Sequence" of a codeword and this is a sequence x0, and x1, --, x7. It can be expressed. For example, in the case of x sequences of "51111125", the 1st element is 5 module width of face, five elements of 1 module width of face is [the

following one element] 2 module width of face following a degree, and the last element is 5 module width of face.

[0028] The set of a possible codeword is divided into a subset exclusive to mutual [which are further called a "cluster" / three]. As PDF417 symbol, a line uses only one of these three clusters, in order to encode data, and each cluster is repeated serially every three lines, respectively. Since the cluster from which every two adjoining line differed is used, a decoder can identify a case so that a scan line may intersect two another lines from a certain line between scans by existence of the codeword from this different line, without a scan line aligning correctly with each line.

[0029] The cluster number of a codeword can be determined from the x sequences using the following formulas. Namely, a cluster number = $(x_0 - x_2 + x_4 - x_6) \bmod 9$, however "mod 9" are too much things after dividing by 9. At x sequences of the codeword of the above-mentioned example, a cluster number is cluster number = $(5 - 1 + 1 - 2) \bmod 9$. It is calculated like $9 = 3$.

[0030] In order to make an error probability into min, although PDF417 can use nine clusters mathematically, it is using only three clusters. Therefore, each line uses only three clusters 0 and 3 or 1 of 6, and encodes data with the same cluster repeated serially every three lines. For example, line 0 codeword uses a cluster 0, a line 1 uses a cluster 3 and a line 2 uses a cluster 6. Generally, a cluster number can be determined from a line number like cluster number = $(\text{line number}) \bmod 3 * 3$.

[0031] The codeword value of 929 pieces is defined in PDF417. These values are 0 thru/or 928. Each cluster expresses the available value with a separate bar and the pattern of a tooth space of 929 pieces so that a certain cluster cannot be confused with another cluster.

[0032] (C) of drawing 1 is the perspective view in which simplifying very much and showing luminescence and the photo detector of a bar code reader according to the 1st example of this invention. The light source 105 and the lens 106 (or AREI of such a lens) for focuses like light emitting diode (or AREI of light emitting diode) are used in order to be a narrow rectangle pattern ideally and to illuminate a visual field with the light which rises high.

[0033] A reader is positioned in the bar code symbol 104 upper part so that at least one line of the whole of a symbol 104 may be illuminated completely. The light which it was reflected, i.e., was distributed is returned to a reader through the condensing optical system 107, and is returned to linear photodiode AREI 108, i.e., image sensors.

[0034] Photodiode AREI changes the image showing the line of a bar code symbol into an electrical signal. this electrical signal is decoded (or it tries so that it may be decoded -- having), and that result is used for a next image and next signal processing so that it may be later mentioned with the block diagram of this invention as shown in (C) of drawing 2.

[0035] Although mainly related with a CCD reader for this invention to read a stacked bar code, i.e., a two dimensions bar code, the description of one arbitration of this invention can be used also in a laser scan bar code reader, and shows this case to (A) of drawing 2 as the 2nd example of this invention again.

[0036] That is, (A) of drawing 2 is the sectional view which the anterior part 109 of the housing 100 in the example of a laser scan of a bar code reader simplified very much, and the light source 110 and the window 111 with the flat upper part 112 and the convex lower part 113 are shown. It passes through the upper part 112 and light is irradiated, and the optical detector 114 is arranged at the backside of the lower part 113 so that the reflected light may pass along the lower part 113. As shown in this drawing, in order to prepare the lens in the CCD reader typically used by contacting the symbol which should be read in a suitable location, a window 111 is placed very near the front end of the scanner concerned.

[0037] By narrowing the visual field of the increase of signal level, and a detector, the example of this drawing is used especially for the laser scan bar code reader of the non-retroreflection mold which needs a fixed lens in front of photosensor so that it may be useful to removing a surrounding light.

[0038] (B) of drawing 2 is the front view of the bar code reader incorporating the multiple-purpose window which has a long tubed lens in the 3rd example of this invention. this drawing -- a laser scan bar code reader -- or a CCD reader can be expressed. a line strong against the line of a bar code in parallel in the target distance to which the convex lower part 113 of a window 111 is in the front face of the light

source rather than a detector typically in the case of a CCD reader, and the focus of the light source is carried out by such the lower part 113 -- lighting is formed.

[0039] Both of the bar code readers of a class need the window for protecting from dust, and, as for this, it is desirable that it is a light filter again. Both those functions can be offered by only one shaping plastics section in the form of a window.

[0040] When it summarizes, one of the descriptions of this invention is using a window with one or more parts which form a lens. Such a lens can be arranged in the front face of the light source, an optical detector, or its both according to the class of bar code reader, and its operational request.

[0041] This window can be fabricated with red plastics so that it may function as working like an optical filter in addition to working as a lens. This window has preferably the flat part which an outgoing radiation light beam passes, and the lens-like section for carrying out the focus of the light reflected from the symbol on the photodetector. The lens formed all over the window can be used, in order that it can be tubed or the spherical surface, for example, the pattern of an a large number spherical lens may carry out the focus of the reflected light on each detector according to a scanner demand, or only one long tubed lens can be used with an a large number detector.

[0042] (C) of drawing 2 shows the block diagram of the electronic part of the CCD bar code scanner according to this invention. Image sensors 114 function as pickup for obtaining the image of the visual field of the detector concerned. The electrical signal from these image sensors 114 is supplied to the transfer gate 115, next is supplied to the shift filter 116. This shift register 116 has the output circuit 117 which interfaces with a bus 118. A bus 118 is the main data bus for the computer section of memory 119, CPU120, and the bar code reader section including an interface 121.

[0043] Although this invention is described about reading a single dimension or a two dimensions bar code, it is not limited to such an example and can apply also to more complicated symbol scan application. The approach of this invention can find out the application for use by various machine reading or the optical-character-recognition application by which information is acquired from the surface descriptions, such as an alphabetic character or goods scanned, again.

[0044] various voice -- in all [like], each component of a scanner can be assembled [being manufactured as only one printed circuit board or an accumulation module, and] in the very compact package which a scanner is allowed. Such a module can be used exchangeable as a laser scan component for the data collecting system of various different classes. For example, this module can be carried in a hand-held scanner as the subcomponent or subassembly of the data collecting system which alternative use could be carried out in the table-top-type scanner attached in the rear face on the top face of a table or it was attached in the flexible arm, and it carried on the front face of a table, or was complicated more.

[0045] As for this module, it is desirable that the optical system carried in subassembly on the supporter and a photodetector component are included. The control line and data line relevant to such a component allow connecting with the electrical connector carried on the edge of the module concerned, or the outer surface, and connecting the module concerned to the matching connector relevant to other components of data collecting system electrically.

[0046] Each module can have the specific scan and decoding property relevant to it, for example, the operability in a certain activity distance, a specific symbol, or the operability in a printing consistency. This property can be defined through manual setting of the control switch relevant to the module concerned again. A user applies again so that the goods of a class which is different in this data collecting system etc. may be scanned, and a system can be applied for the application which changed with inter exchange modules on data collecting system through use of an easy electrical connector.

[0047] The scanning module mentioned above can be performed again in a keyboard, a display, a printer, data storage, application software, and the data collecting system of the self-contained system containing one or more components like a database. such a system -- again -- data collecting system -- other components of a Local Area Network -- or a modem -- or the communication link interface which allows communicating with a telephone-exchange network by the low-power output radio broadcasting from a portable terminal to a fixed receiver can be included through an ISDN interface.

[0048] It will be understood each of the above-mentioned description, two, or more that the application in a different bar code reader from the scanner of other classes and the above-mentioned class which can be used can be found out.

[0049] Although the example of this invention was explained above, as for this invention, it is needless to say that various deformation and configuration-modification can be made, without not being limited to this and deviating from the pneuma of this invention. For example, other fixed image sensors (for example, CMD) may be used instead of CCD.

[0050] In addition, according to the above-mentioned embodiment of this invention, the following solves and a configuration is obtained.

(1) In the symbol information reading approach of reading a bar code symbol etc. The 1st step which picturizes optically the visual field containing a symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged by linear light detector AREI, The 2nd step which transmits the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe to memory, Until the 3rd step which is made to move the above-mentioned linear light detector rhe, and picturizes another line of the above-mentioned symbol, and all the lines of the above-mentioned symbol are read The symbol information reading approach characterized by providing the 4th step performed by repeating the above 1st thru/or the 3rd step, and the 5th step which generates the data output showing the bar code information included in the above-mentioned symbol.

[0051] (2) An approach given in (1) characterized by providing further the step which decodes the binary data stored in the above-mentioned memory to the data expressed in the line of the above-mentioned bar code symbol for every party so that each line may be picturized.

[0052] (3) The 1st step of the above is an approach given in (1) characterized by including the step which turns light on the above-mentioned visual field, and the step which collects the reflected lights on above-mentioned linear light detector AREI.

[0053] (4) The step which turns the above-mentioned light is an approach given in (3) characterized by including using the light emitting diode light source.

(5) The step which turns the above-mentioned light is an approach given in (3) characterized by including using the semiconductor laser diode light source.

[0054] (6) It is an approach given in (1) characterized by for the above-mentioned linear light detector rhe being a CCD device, and including that the 2nd step of the above accesses above-mentioned linear light detector AREI continuously.

[0055] (7) The 3rd step of the above is an approach given in (1) characterized by being carried out by the user by the manual by carrying out the sweep of the bar code symbol perpendicularly.

[0056] (8) The light source for illuminating the above-mentioned symbol in the symbol information reader which reads a bar code symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged etc., An optical detector rhe with the visual field containing one line of the above-mentioned symbol, and the means for transmitting the binary data corresponding to the light which collides with the above-mentioned optical detector rhe to memory, The means for decoding the above-mentioned binary data in the above-mentioned memory to the data expressed by one line of the above-mentioned symbol, The memory means for accumulating the data expressed by each line of the above-mentioned symbol as each line is read, The symbol information reader characterized by providing the means for generating the data output showing the bar code information which determines that each line of the whole symbol was read and is included in the above-mentioned symbol.

[0057] (9) The above-mentioned light source is equipment given in (8) characterized by including AREI of light emitting diode.

(10) The above-mentioned optical detector rhe is equipment given in (8) characterized by being a CCD device.

[0058] In the photo-electric-conversion scanner for reading a symbol with the part of a different rate of a light reflex (11) Housing, The means for being carried in the above-mentioned housing, generating a

light beam, and carrying out orientation of it along with the Deji, A detector means to generate the electrical signal with which it is carried in the above-mentioned housing, the light reflected as the above-mentioned symbol on a visual field is detected, and the above-mentioned symbol is expressed, The photo-electric-conversion scanner characterized by providing a window means to have the 1st part for carrying out the focus of the light beam which it is carried in the above-mentioned housing and left to the above-mentioned exterior, and the 2nd part for turning it to the above-mentioned detector means in response to the above-mentioned reflected light.

[0059] (12) A means to generate the above-mentioned light beam is a photo-electric-conversion scanner given in (11) characterized by being LED AREI.

(13) A means to generate the above-mentioned light beam is a photo-electric-conversion scanner given in (11) characterized by being laser diode AREI.

[0060] (14) The above-mentioned window means is a photo-electric-conversion scanner given in (11) characterized by being the single window carried in the anterior part of the above-mentioned housing.

(15) The above-mentioned detector means is a photo-electric-conversion scanner given in (11) characterized by being a CCD device.

[0061]

[Effect of the Invention] As explained in full detail above, according to this invention, easy and the comparatively efficient technique for reading a 2-dimensional bar code symbol using a comparatively cheap CCD mold bar code scanner can be offered.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention relates to what reads a stacked bar code, i.e., a two dimensions bar code, especially using an individual image sensor technique about the photo-electric-conversion scanner used for the symbol information reading approach, the equipment, and it which carry out photo electric conversion of the symbol which has generally the part from which rates of a light reflex, such as a bar code, differ, and read it.

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PRIOR ART

[Description of the Prior Art] In recent years, the optical reader and optical scanner system which read the bar code symbol soon formed in front faces, such as a label stuck on front faces, such as goods, or its goods, have been developed variously. A bar code symbol is a symbol constituted with a series of bars which have the various width of face which consists of a bar and a tooth space with a mutually different light reflex property, opened spacing mutually by the tooth space between various width of face, and has been arranged. The above-mentioned reader and a scanner system carry out photo electric conversion of the graphical symbol to an electric signal, and decode it to the alphanumeric characters meaning the description of explanation of the goods concerned or some of goods concerned. Such an alphanumeric alphabetic character is usually expressed by digital data, is used as an input to data processing system, and is applied to POS (point OBU sales = point-of-sales system) processing, stock control, etc. This kind of common scanner system is indicated by for example, a U.S. Pat. No. 4,251,798 specification, a U.S. Pat. No. 4,369,361 specification, the U.S. Pat. No. 4,387,297 specification, the U.S. Pat. No. 4,409,470 specification, the U.S. Pat. No. 4,760,248 specification, the U.S. Pat. No. 4,896,026 specification, etc.

[0003] As one gestalt of such a scanner system, there is a hand-held pocket mold laser scanner head, and when a user has by hand, this is taken as the configuration which can aim the head concerned, especially a laser beam at the target and symbol which should be read, as indicated by some of these United States patents.

[0004] Although it is common that gas laser and semiconductor laser are used as for the light source in a laser scanner bar code reader, it is desirable to use a semiconductor device especially as the light source in a scanner system especially from the small thing, that it is a low price, and the point of low power consumption. The optical member for focuses is optically deformed by the laser beam, and it usually makes the beam spot of predetermined magnitude from target distance by it. As for the magnitude of the beam spot in this target distance, it is desirable that it is almost the same as the minimum width of face between the fields where the rates of a light reflex differ (i.e., between the bar of a symbol and tooth spaces).

[0005] A bar code symbol is formed from the element of a bar, i.e., the rectangle configuration which can have various width of face. The specific array of such an element defines a character and this is expressed according to the set of the regulation determined, the code, i.e., a "symbol system", used, and a definition. The relative magnitude of a bar and a tooth space is determined by the class of code used, and is similarly determined by the class of code for which the actual size of a bar and a tooth space is also used. The number of the characters of per 1 inch (2.54cm) expressed by the bar code symbol is called the consistency of a symbol. In order to encode a series of alphabetic characters of a wish, the array of an element expressed by the element of the group to whom each alphabetic character of the message corresponds in itself is tied up in both sets, and a perfect bar code symbol is formed. In some symbol systems, peculiar "start" and "stop" character which show the starting position and termination location of the bar code are used. There is a bar code symbol system from which current and a large number differed, and a UPC/EAN code, CODE39 and CODE128, CODABAR (NW-7), the ITF (Interleaved 2 of 5) code, etc. are known.

[0006] The character which is not recognized to be a just character according to the symbol system again, and is not defined in the character which is recognized according to a symbol system and defined here for the following explanation shall be called an abnormality character. Therefore, the array of the element which cannot be decoded according to a certain symbol system is equivalent to the abnormality character for the symbol system concerned.

[0007] Since amount of information recordable [are shown on the surface field of predetermined magnitude, i.e.,] is increased, the new bar code symbol of recent years some has been developed. CODE49 which is 1 ** standard [those / new] for a code has drawn the concept of "2-dimensional one" by accumulating the train of a character perpendicularly instead of extending a bar horizontally. That is, there are some lines of a bar and the pattern of a tooth space instead of only one line. The structure of this CODE49 is indicated by the U.S. Pat. No. 4,794,239 specification. Moreover, another structure known as "PDF417" is discussed by the United States patent application No. 461,881.

[0008] In a scanner system known in the field concerned, a light beam is turned to the target containing a bar code symbol by the lens or the same optical element arranged on an optical path on the front face. By motion of a scan component like the mirror arranged in the path of a light beam, a light beam crosses a symbol and the scanner of a beam migration mold operates by making a party or a series of multi-lines repeat and scan. A symbol is crossed, the sweep of the beam spot is carried out, it reaches and the above-mentioned scan component traces the scan line which crosses a symbol and through which it passes, or the sweep of the visual field of a scanner is carried out, and it is scanned. Or the sweep of both of visual fields of a scanner may be carried out to the beam spot.

[0009] The bar code reading system contains, the sensor, i.e., the photodetector, which functions as detecting the light which it was reflected from the symbol, i.e., was scattered about again. A photodetector, i.e., a sensor, is arranged in the optical path in a scanner so that it may have a visual field slightly larger than full [of a symbol]. The part of the light reflected namely, scattered about from the symbol is detected, and it is changed into an electrical signal. An electrical circuit or software is decoded to the digital representation of data with which it is expressed by the symbol which had this electrical signal scanned. For example, the analog electrical signal generated by the photodetector is convertible for a pulse-width-modulation digital signal with the width of face corresponding to the physical width of face of a bar and a tooth space. Such a digital signal is decoded by the binary data of the data encoded by the symbol next based on the specific symbol system used by the symbol concerned, and is changed into the alphanumeric alphabetic character which it means after that.

[0010] As decoding in a known bar code reading system is the following, it is usually performed. A decoder receives a pulse-width-modulation digital signal from a bar code reader, and it tries it so that the algorithm performed by software may decode the scan. If a start and a stop character, and a character in the meantime are completely decoded with that scan, this decoding will be finished and a user will be provided with the directions which show that it was able to read correctly (it is (like a green light and/or a beep sound)). Or a decoder tries another decoding on the scan in response to the next scan until the scan decoded completely is reached (i.e., until the scan beyond it is no longer obtained).

[0011] Next, such a signal is decoded by the binary data of the data encoded by the symbol according to the specific symbol system, and the alphanumeric alphabetic character which it means.

[0012] A beam migration mold laser scanner is not the only class of optical equipment which can read a bar code symbol. The bar code reader of another class especially relevant to this invention incorporates the detector based on a charge-coupled-device (CCD) technique. In such a conventional reader, it is [whether it is usually larger than the symbol which the magnitude of a detector should read, and] the almost same magnitude. The whole symbol is filled with the light from a reader, each CCD cel is read serially, and existence of a bar or a tooth space is determined. Although such a reader can be used that it is lightweight and easily, it needs to arrange whether a reader is mostly contacted as a symbol directly so that a symbol can be read appropriately. Such physical contact to the symbol of a reader is the mode in which actuation is desirable for some application, and is the individual liking by the user, not to mention it.

[0013] The reading depth of a CCD bar code scanner is restricted very much as compared with the

scanner of a laser mold. The reason is because the f number of the scanner of a CCD mold with for example, the LED light source is very lower than the f number of a laser scanner. As the result, the reading depth proportional to the square of the f number is very low for the scanner of such a CCD/LED mold.

[0014] Other descriptions of the bar code scanner of a CCD mold are shown in the United States patent application No. (these contents are indicated by JP,2-268383,A) 317,553 and No. 717,771. These applications have illustrated the approach of collecting and reading the conventional engineering practice and conventional 2-dimensional symbol in a CCD scanner.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, according to this invention, easy and the comparatively efficient technique for reading a 2-dimensional bar code symbol using a comparatively cheap CCD mold bar code scanner can be offered.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, at the Prior art shown in a patent and patent application which were mentioned above, there were still no easy and comparatively efficient technique for reading a 2-dimensional bar code symbol using a comparatively cheap CCD mold bar code scanner. [0016] This invention was made in view of the above-mentioned point, and aims at easy and offering a comparatively efficient weekly report for reading a 2-dimensional bar coat symbol using a comparatively cheap CCD mold bar code scanner.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the symbol information reading approach by this invention The 1st step which picturizes optically the visual field containing a symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged by linear light detector AREI, The 2nd step which transmits the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe to memory, Until the 3rd step which is made to move the above-mentioned linear light detector rhe, and picturizes another line of the above-mentioned symbol, and all the lines of the above-mentioned symbol are read It is characterized by having the 4th step performed by repeating the above 1st thru/or the 3rd step, and the 5th step which generates the data output showing the bar code information included in the above-mentioned symbol.

[0018] Moreover, the symbol information reader by this invention The light source for being the symbol information reader which reads a bar code symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged etc., and illuminating the above-mentioned symbol, An optical detector rhe with the visual field containing one line of the above-mentioned symbol, and the means for transmitting the binary data corresponding to the light which collides with the above-mentioned optical detector rhe to memory, The means for decoding the above-mentioned binary data in the above-mentioned memory to the data expressed by one line of the above-mentioned symbol, The memory means for accumulating the data expressed by each line of the above-mentioned symbol as each line is read, It determines that each line of the whole symbol was read, and is characterized by having a means for generating the data output showing the bar code information included in the above-mentioned symbol.

[0019] The photo-electric-conversion scanner by this invention is a photo-electric-conversion scanner for reading a symbol with the part of a different rate of a light reflex. Furthermore, housing, The means for being carried in the above-mentioned housing, generating a light beam, and carrying out orientation of it along with the Deji, A detector means to generate the electrical signal with which it is carried in the above-mentioned housing, the light reflected as the above-mentioned symbol on a visual field is detected, and the above-mentioned symbol is expressed, It is carried in the above-mentioned housing and characterized by having a window means to have the 1st part for carrying out the focus of the light beam left to the above-mentioned exterior, and the 2nd part for turning it to the above-mentioned detector means in response to the above-mentioned reflected light.

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OPERATION

[Function] That is, the visual field containing a symbol with two or more dimensions by which the line which has two or more codewords of the bar code information which should be read according to the symbol information reading approach and equipment of this invention adjoined, and has been arranged is optically picturized by the linear light detector rhe, and the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe are transmitted to memory. And the above-mentioned memory transfer and a migration process are repeated until the above-mentioned linear light detector rhe is moved, it picturizes another line of the above-mentioned symbol and all the lines of the above-mentioned symbol are read. And the data output showing the bar code information included in the above-mentioned symbol is generated.

[0021] Moreover, the photo-electric-conversion scanner of this invention has the window applicable to the bar code scanner of all classes. To a symbol, this window carries out the focus of the light beam emitted from the light source by the 1st convex part, turns it, and transmits it to the detector inside housing in response to the reflected light from a symbol by the 2nd flat part.

[0022] In addition, the vocabulary "the symbol" and the "bar code" which are used into this specification do not mean only the pattern with which the mutual bar of various width of face and the tooth space were put together, and have the semantics of a wide sense which also includes other single dimensions or a 2-dimensional graphic pattern like an alphanumeric alphabetic character.

[0023] Again both this inventions offer the approach and equipment for operating the bar code reading system which can read two kinds of different bar codes which are a standard linear bar code, especially a two dimensions bar code. A user makes the sweep of the bar code carry out perpendicularly, and this invention offers the technique in which suitable software reads a two dimensions bar code a party every at once, and can decode it again.

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EXAMPLE

[Example] Hereafter, the example of this invention is explained with reference to a drawing. (A) of drawing 1 is the perspective view in which simplifying very much and showing the bar code reader of the stock mold as the 1st example according to this invention. A reader is incorporable into a pocket mold scanner, or a bar code label can read it and it can be built also into a thing like the table-top-type workstation by which crosses a head and a sweep is carried out, or a fixed mold scanner again. In this example, the reader is incorporated into the lightweight plastics housing 100 of a stock mold. This housing 100 is manually arranged by the user so that the bar code 101 printed on the label 102 stuck on the goods 103 grade may be contacted.

[0025] (B) of drawing 1 shows the 2-dimensional bar code symbol 104 of the PDF417 format which should be read with the equipment of this invention. PDF417 symbol consists of the stack of the line of the bar-code-ized information. Each line of this symbol consists of a start pattern, some symbol characters called a "codeword", and a stop pattern. A codeword is a building block for expressing a certain numeric value and alphabetic character, or another symbol, or encoding a related value. Making it a bundle, the codeword of each line forms a data stream.

[0026] Both the number of the lines of PDF417 symbol and the number of trains are adjustable. if this symbol does not have at least three lines, it will not become, but it can have even 90 lines. Similarly, the codeword in each line, i.e., the number of data streams, is changeable from three trains to 30 trains.

[0027] Each codeword in PDF417 consists of 17 modules, i.e., a unit. There are four bars and four tooth spaces in each codeword. Although each bar or tooth space can change width of face from one module even to six modules, the totals with which per codeword was combined are always 17 modules.

Therefore, each codeword can be defined by the sequence showing 4 sets of sets of the mutual bar in a codeword, and the width of face of a tooth space of 8 figures. It is called "x Sequence" of a codeword and this is a sequence x_0 , and x_1 , --, x_7 . It can be expressed. For example, in the case of x sequences of "51111125", the 1st element is 5 module width of face, five elements of 1 module width of face is [the following one element] 2 module width of face following a degree, and the last element is 5 module width of face.

[0028] The set of a possible codeword is divided into a subset exclusive to mutual [which are further called a "cluster" / three]. As PDF417 symbol, a line uses only one of these three clusters, in order to encode data, and each cluster is repeated serially every three lines, respectively. Since the cluster from which every two adjoining line differed is used, a decoder can identify a case so that a scan line may intersect two another lines from a certain line between scans by existence of the codeword from this different line, without a scan line aligning correctly with each line.

[0029] The cluster number of a codeword can be determined from the x sequences using the following formulas. Namely, a cluster number = $(x_0 - x_2 + x_4 - x_6) \bmod 9$, however "mod 9" are too much things after dividing by 9. At x sequences of the codeword of the above-mentioned example, a cluster number is cluster number = $(5 - 1 + 1 - 2) \bmod 9$. It is calculated like $9 = 3$.

[0030] In order to make an error probability into min, although PDF417 can use nine clusters mathematically, it is using only three clusters. Therefore, each line uses only three clusters 0 and 3 or 1

of 6, and encodes data with the same cluster repeated serially every three lines. For example, line 0 codeword uses a cluster 0, a line 1 uses a cluster 3 and a line 2 uses a cluster 6. Generally, a cluster number can be determined from a line number like cluster number $=(\text{line number}) \pmod 3 * 3$.

[0031] The codeword value of 929 pieces is defined in PDF417. These values are 0 thru/or 928. Each cluster expresses the available value with a separate bar and the pattern of a tooth space of 929 pieces so that a certain cluster cannot be confused with another cluster.

[0032] (C) of drawing 1 is the perspective view in which simplifying very much and showing luminescence and the photo detector of a bar code reader according to the 1st example of this invention. The light source 105 and the lens 106 (or AREI of such a lens) for focuses like light emitting diode (or AREI of light emitting diode) are used in order to be a narrow rectangle pattern ideally and to illuminate a visual field with the light which rises high.

[0033] A reader is positioned in the bar code symbol 104 upper part so that at least one line of the whole of a symbol 104 may be illuminated completely. The light which it was reflected, i.e., was distributed is returned to a reader through the condensing optical system 107, and is returned to linear photodiode AREI 108, i.e., image sensors.

[0034] Photodiode AREI changes the image showing the line of a bar code symbol into an electrical signal. this electrical signal is decoded (or it tries so that it may be decoded -- having), and that result is used for a next image and next signal processing so that it may be later mentioned with the block diagram of this invention as shown in (C) of drawing 2.

[0035] Although mainly related with a CCD reader for this invention to read a stacked bar code, i.e., a two dimensions bar code, the description of one arbitration of this invention can be used also in a laser scan bar code reader, and shows this case to (A) of drawing 2 as the 2nd example of this invention again.

[0036] That is, (A) of drawing 2 is the sectional view which the anterior part 109 of the housing 100 in the example of a laser scan of a bar code reader simplified very much, and the light source 110 and the window 111 with the flat upper part 112 and the convex lower part 113 are shown. It passes through the upper part 112 and light is irradiated, and the optical detector 114 is arranged at the backside of the lower part 113 so that the reflected light may pass along the lower part 113. As shown in this drawing, in order to prepare the lens in the CCD reader typically used by contacting the symbol which should be read in a suitable location, a window 111 is placed very near the front end of the scanner concerned.

[0037] By narrowing the visual field of the increase of signal level, and a detector, the example of this drawing is used especially for the laser scan bar code reader of the non-retroreflection mold which needs a fixed lens in front of photosensor so that it may be useful to removing a surrounding light.

[0038] (B) of drawing 2 is the front view of the bar code reader incorporating the multiple-purpose window which has a long tubed lens in the 3rd example of this invention. this drawing -- a laser scan bar code reader -- or a CCD reader can be expressed. a line strong against the line of a bar code in parallel in the target distance to which the convex lower part 113 of a window 111 is in the front face of the light source rather than a detector typically in the case of a CCD reader, and the focus of the light source is carried out by such the lower part 113 -- lighting is formed.

[0039] Both of the bar code readers of a class need the window for protecting from dust, and, as for this, it is desirable that it is a light filter again. Both those functions can be offered by only one shaping plastics section in the form of a window.

[0040] When it summarizes, one of the descriptions of this invention is using a window with one or more parts which form a lens. Such a lens can be arranged in the front face of the light source, an optical detector, or its both according to the class of bar code reader, and its operational request.

[0041] This window can be fabricated with red plastics so that it may function as working like an optical filter in addition to working as a lens. This window has preferably the flat part which an outgoing radiation light beam passes, and the lens-like section for carrying out the focus of the light reflected from the symbol on the photodetector. The lens formed all over the window can be used, in order that it can be tubed or the spherical surface, for example, the pattern of an a large number spherical lens may carry out the focus of the reflected light on each detector according to a scanner demand, or only one

long tubed lens can be used with an a large number detector.

[0042] (C) of drawing 2 shows the block diagram of the electronic part of the CCD bar code scanner according to this invention. Image sensors 114 function as pickup for obtaining the image of the visual field of the detector concerned. The electrical signal from these image sensors 114 is supplied to the transfer gate 115, next is supplied to the shift filter 116. This shift register 116 has the output circuit 117 which interfaces with a bus 118. A bus 118 is the main data bus for the computer section of memory 119, CPU120, and the bar code reader section including an interface 121.

[0043] Although this invention is described about reading a single dimension or a two dimensions bar code, it is not limited to such an example and can apply also to more complicated symbol scan application. The approach of this invention can find out the application for use by various machine reading or the optical-character-recognition application by which information is acquired from the surface descriptions, such as an alphabetic character or goods scanned, again.

[0044] various voice -- in all [like], each component of a scanner can be assembled [being manufactured as only one printed circuit board or an accumulation module, and] in the very compact package which a scanner is allowed. Such a module can be used exchangeable as a laser scan component for the data collecting system of various different classes. For example, this module can be carried in a hand-held scanner as the subcomponent or subassembly of the data collecting system which alternative use could be carried out in the table-top-type scanner attached in the rear face on the top face of a table or it was attached in the flexible arm, and it carried on the front face of a table, or was complicated more.

[0045] As for this module, it is desirable that the optical system carried in subassembly on the supporter and a photodetector component are included. The control line and data line relevant to such a component allow connecting with the electrical connector carried on the edge of the module concerned, or the outer surface, and connecting the module concerned to the matching connector relevant to other components of data collecting system electrically.

[0046] Each module can have the specific scan and decoding property relevant to it, for example, the operability in a certain activity distance, a specific symbol, or the operability in a printing consistency. This property can be defined through manual setting of the control switch relevant to the module concerned again. A user applies again so that the goods of a class which is different in this data collecting system etc. may be scanned, and a system can be applied for the application which changed with inter exchange modules on data collecting system through use of an easy electrical connector.

[0047] The scanning module mentioned above can be performed again in a keyboard, a display, a printer, data storage, application software, and the data collecting system of the self-contained system containing one or more components like a database. such a system -- again -- data collecting system -- other components of a Local Area Network -- or a modem -- or the communication link interface which allows communicating with a telephone-exchange network by the low-power output radio broadcasting from a portable terminal to a fixed receiver can be included through an ISDN interface.

[0048] It will be understood each of the above-mentioned description, two, or more that the application in a different bar code reader from the scanner of other classes and the above-mentioned class which can be used can be found out.

[0049] Although the example of this invention was explained above, as for this invention, it is needless to say that various deformation and configuration-modification can be made, without not being limited to this and deviating from the pneuma of this invention. For example, other fixed image sensors (for example, CMD) may be used instead of CCD.

[0050] In addition, according to the above-mentioned embodiment of this invention, the following solves and a configuration is obtained.

(1) In the symbol information reading approach of reading a bar code symbol etc. The 1st step which picturizes optically the visual field containing a symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged by linear light detector AREI, The 2nd step which transmits the binary data corresponding to the light which collides with the above-mentioned linear light detector rhe to memory, Until the 3rd step

which is made to move the above-mentioned linear light detector rhe, and picturizes another line of the above-mentioned symbol, and all the lines of the above-mentioned symbol are read The symbol information reading approach characterized by providing the 4th step performed by repeating the above 1st thru/or the 3rd step, and the 5th step which generates the data output showing the bar code information included in the above-mentioned symbol.

[0051] (2) An approach given in (1) characterized by providing further the step which decodes the binary data stored in the above-mentioned memory to the data expressed in the line of the above-mentioned bar code symbol for every party so that each line may be picturized.

[0052] (3) The 1st step of the above is an approach given in (1) characterized by including the step which turns light on the above-mentioned visual field, and the step which collects the reflected lights on above-mentioned linear light detector AREI.

[0053] (4) The step which turns the above-mentioned light is an approach given in (3) characterized by including using the light emitting diode light source.

(5) The step which turns the above-mentioned light is an approach given in (3) characterized by including using the semiconductor laser diode light source.

[0054] (6) It is an approach given in (1) characterized by for the above-mentioned linear light detector rhe being a CCD device, and including that the 2nd step of the above accesses above-mentioned linear light detector AREI continuously.

[0055] (7) The 3rd step of the above is an approach given in (1) characterized by being carried out by the user by the manual by carrying out the sweep of the bar code symbol perpendicularly.

[0056] (8) The light source for illuminating the above-mentioned symbol in the symbol information reader which reads a bar code symbol with two or more dimensions by which the line with two or more codewords of the bar code information which should be read adjoined, and has been arranged etc., An optical detector rhe with the visual field containing one line of the above-mentioned symbol, and the means for transmitting the binary data corresponding to the light which collides with the above-mentioned optical detector rhe to memory, The means for decoding the above-mentioned binary data in the above-mentioned memory to the data expressed by one line of the above-mentioned symbol, The memory means for accumulating the data expressed by each line of the above-mentioned symbol as each line is read, The symbol information reader characterized by providing the means for generating the data output showing the bar code information which determines that each line of the whole symbol was read and is included in the above-mentioned symbol.

[0057] (9) The above-mentioned light source is equipment given in (8) characterized by including AREI of light emitting diode.

(10) The above-mentioned optical detector rhe is equipment given in (8) characterized by being a CCD device.

[0058] In the photo-electric-conversion scanner for reading a symbol with the part of a different rate of a light reflex (11) Housing, The means for being carried in the above-mentioned housing, generating a light beam, and carrying out orientation of it along with the Deji, A detector means to generate the electrical signal with which it is carried in the above-mentioned housing, the light reflected as the above-mentioned symbol on a visual field is detected, and the above-mentioned symbol is expressed, The photo-electric-conversion scanner characterized by providing a window means to have the 1st part for carrying out the focus of the light beam which it is carried in the above-mentioned housing and left to the above-mentioned exterior, and the 2nd part for turning it to the above-mentioned detector means in response to the above-mentioned reflected light.

[0059] (12) A means to generate the above-mentioned light beam is a photo-electric-conversion scanner given in (11) characterized by being LED AREI.

(13) A means to generate the above-mentioned light beam is a photo-electric-conversion scanner given in (11) characterized by being laser diode AREI.

[0060] (14) The above-mentioned window means is a photo-electric-conversion scanner given in (11) characterized by being the single window carried in the anterior part of the above-mentioned housing.

(15) The above-mentioned detector means is a photo-electric-conversion scanner given in (11)

characterized by being a CCD device.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective view of the optical scan system in the 1st example of this invention for (A) to read a bar code and (B) are drawings showing the bar code label of PDF-417 coding scheme as an example of a 2-dimensional bar code symbol, and (C) is the outline perspective view which luminescence of the bar code reader in the 1st example of this invention and a photo detector simplified very much.

[Drawing 2] the nose of the laser scan bar code scanner with which (A) incorporated the multiple-purpose window in the 2nd example of this invention -- the sectional view of a part, i.e., a point, and (B) are the front views of the bar code scanner incorporating the multiple-purpose window in the 3rd example of this invention, and (C) is the block diagram which the bar code scanner according to this invention simplified very much.

[Description of Notations]

100 -- Lightweight plastics housing of a stock mold, 101 -- Bar code, 102 -- A label, 103 -- Goods, 104 -- The 2-dimensional bar code symbol of PDF417 format, 105 -- The light source, 106 -- The lens for focuses, 107 -- Condensing optical system, 108 -- Linear photodiode AREI, 109 -- Housing anterior part, 110 -- The light source, 111 -- A window, 112 -- The flat upper part of a window, 113 [-- A shift register, 117 / -- An output circuit, 118 / -- A bus, 119 / -- Memory, 120 / -- CPU, 121 / -- Interface.] -- The convex lower part of a window, 114 -- An optical detector (image sensors), 115 -- The transfer gate, 116

[Translation done.]

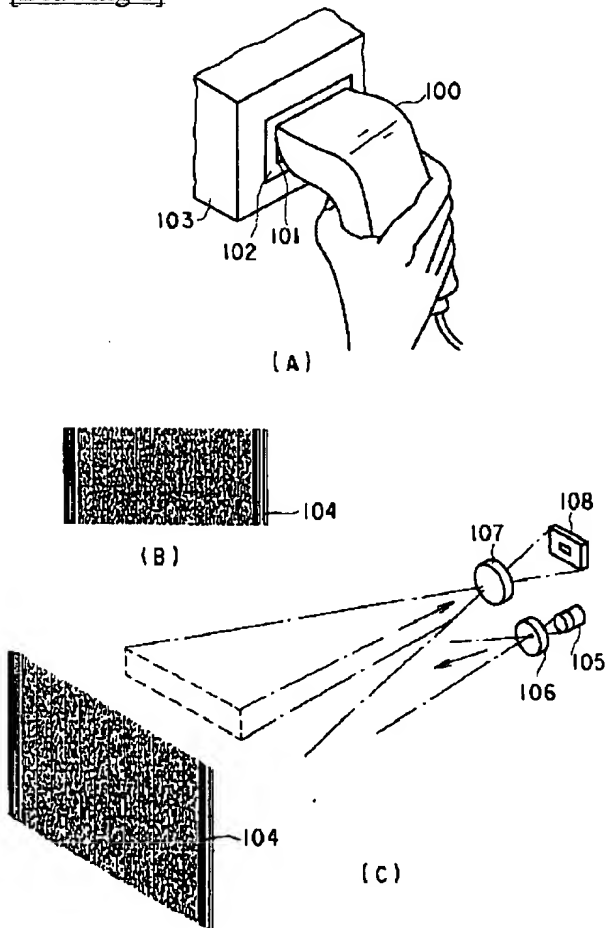
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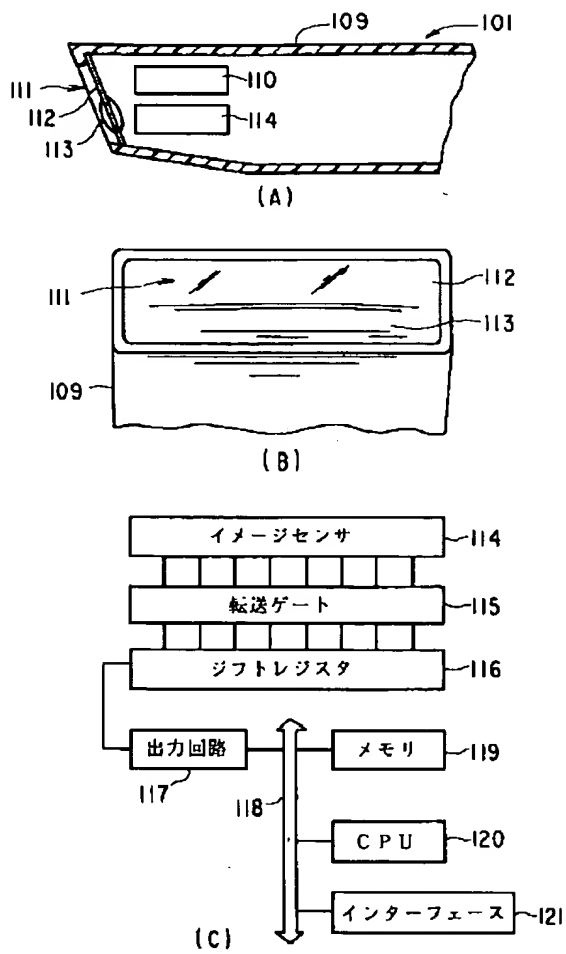
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DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]